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The USSR's Baikal-Amur Mainline Railroad: Driving the Golden Spike

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An Intelligence Assessment

NGA Review
Complete

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*SOV 84-10193
IA 84-10083
November 1984*

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An Intelligence Assessment

This paper was prepared by [redacted] Office of
Soviet Analysis, and [redacted]

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[redacted] Contributions were made by

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[redacted] of SOVA. Background
information was provided by the Office of Global
Issues and the Office of East Asian Analysis.

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Comments and queries are welcome and may be
addressed to the Chief, Soviet Economy Division,
SOVA [redacted]

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*SOV 84-10193
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**The USSR's Baikal-Amur
Mainline Railroad:
Driving the Golden Spike**

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Key Judgments

*Information available
as of 30 September 1984
was used in this report.*

The Soviets claim that they completed tracklaying on the Baikal-Amur Mainline (BAM) on 29 September 1984. Even though the Soviets have completed a track along the entire 4,333-kilometer line, the BAM is far from finished. Indeed, [redacted] Soviet statements suggest that, if passengers boarded a train to traverse the BAM now, they would have a thrilling ride: scaling steep slopes to bypass unfinished tunnels, negotiating tight S-curves, and guessing the whereabouts of some 1,400 construction defects found by inspectors in 1983 [redacted]

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The completion of tracklaying this year probably was a symbolic gesture to end the years of campaigning on a triumphant note. With engineering problems pushing full completion of the line well beyond the original deadline (1983) and even the revised deadline (1985), the Kremlin struck a face-saving compromise—complete “something” ahead of schedule and then resolve the remaining problems removed from the spotlight of international attention. To add luster to the occasion, the Central Committee in a decree last March scheduled the completion of tracklaying for 7 November 1984, the anniversary of the October Revolution. Full operation of the railroad was delayed, however, until 1987 or 1988. [redacted]

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But the strategy appears to have backfired. The push to accelerate tracklaying resulted in numerous instances of shoddy workmanship and dangerous shortcuts—probably including a major tunnel collapse earlier this year. These added problems may not have been brought to Moscow’s attention until June 1984 when the Kremlin’s transportation overseer, Geydar Aliyev, chaired a meeting to discuss BAM’s problems. During the summer, completion was rescheduled from the date of national celebration to an earlier, less visible date. [redacted]

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The builders of the BAM may well miss the new target for full operation in 1987-88. Finishing the remaining tunnels and bridges and correcting the accumulated mistakes resulting from accelerated construction are only first steps. Electrified segments of the line must be fully wired, and a range of services—depots for passengers and the facilities for repair and maintenance of rolling stock, for example—must be in place and staffed. Soviet claims indicate that the estimated 4 billion rubles already spent on constructing the BAM since 1974 are only the beginning; another 2-4 billion rubles will be needed to bring it into full operation. If these figures are accurate, the BAM must continue to command at least its current budget to meet the new deadline—a questionable prospect if pressures have been reduced by its nominal completion. [redacted]

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The prospects for extracting a payoff from the railroad through development of the vast resources along the BAM corridor look dim until the 1990s. Nevertheless, Moscow has talked about pushing forward on a few selected resource-development projects. Timber in the Far East and iron ore, coking coal, and phosphate deposits in South Yakutiya are the most likely targets. Moscow also has shown some interest in developing high-quality copper and asbestos deposits for export. Although some of these raw materials are in short supply in the Soviet industrial heartland—coking coal, for example—Moscow has better options for resolving the shortages than bearing the large development and transport costs of tapping the distant reserves in the BAM zone [redacted]

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The Soviets have hoped since Stalin's time to lure foreign capital into this resource-rich area to help cover the enormous development costs, estimated at between 15 billion and 25 billion rubles. The BAM, part of the necessary infrastructure, is reaching completion at a poor time for attracting foreign capital. Mineral and metals markets are not as robust as in 1974, when construction of the BAM resumed. For some markets—like copper—the end of the current slump is not in sight. Japan, the Soviets' most likely partner, is expected to reject Moscow's overtures for help in Siberian development during their joint trade talks in the fall of 1984. [redacted]

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The Soviets will take only small steps, primarily to build the infrastructure to support resource development later and to satisfy secondary objectives. When fully operational, the BAM will be an important alternative to the Trans-Siberian Railway (Trans-Sib), which is already pushed to its limit for moving commodities, as well as men and materiel for the military, to the Soviet Far East. Even before the BAM can support its full capacity, it could ease the strain on the Trans-Sib by providing an alternative route for returning container cars to Far Eastern ports for the transshipment of international freight from the Pacific to Europe—the Soviets' land-bridge route that earns \$300 million a year in foreign exchange. [redacted]

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The USSR's Baikal-Amur Mainline Railroad: Driving the Golden Spike

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Introduction

The Soviets claim that they completed tracklaying on the Baikal-Amur Mainline (BAM) on 29 September 1984. Strategic factors were important in the decision to build the BAM, but by far the most important reasons were economic. This multibillion dollar project, whose construction spans nearly six decades, represents a world-class engineering challenge. It is not only long—about the length of the first transcontinental railroad in the United States (see figure 2)—but also traverses the hostile environment and difficult terrain between Tayshet in East Siberia and Sovetskaya Gavan' on the Pacific coast.

This paper assesses the line's status, the decisions about Siberian resource developments facing the Soviets, and the outlook for obtaining a payoff from this expensive investment project.

Status of the BAM

In March 1984 the Soviet Central Committee issued a decree calling for the completion of tracklaying on the BAM by 7 November 1984, the 67th anniversary of the October Revolution. The Soviets were to celebrate the completion of tracklaying on that date near Kuanda, a major station on the BAM (see figure 3). During the summer, however, the Soviets accelerated the pace of tracklaying and claimed completion of the line on 29 September 1984, a date with no known prestige value, at Balbukhta, a minor station on the BAM.

Evidence—gathered from open-source literature [redacted] has been accumulating that the BAM as it now exists falls far short of being the line originally planned by Moscow. Indeed, other Soviet reports state that full operation will not be possible until later in the 1980s. We believe that the Soviets decided to accelerate tracklaying to end the BAM publicity on a triumphant note and thereafter to shift the spotlight

away from this problem-riddled project. But acceleration itself caused additional difficulties and encouraged shoddy construction, the scope of which even the Kremlin may not have been aware of until early last summer.

Picking Up the Pace

We believe that the decision to speed up tracklaying was made before fall 1982 and probably as early as 1981. We base this judgment on the significant change in the pace of construction

[redacted] and Soviet claims of a sharp increase in spending for the BAM in 1982.

According to Soviet reports in December 1981, the volume of construction work on the BAM was to increase by 90 million rubles in 1982. By our accounts of BAM spending, this would have amounted to an 18-percent increase (see table 1) and probably coincides with the initial decision to complete tracklaying by 1984.

This increase in spending probably was not implemented until 1983, however. [redacted] the pace of tracklaying on the BAM significantly increased during 1983 (see table 2). Builders laid about 25 km of track per month between late 1979 and early 1983. Completion of tracklaying under this schedule would have occurred by late 1985 or early 1986. From February to October 1983, the rate of construction increased by 40 percent to at least 35 km per month.¹ Construction on the western segment

[redacted] acceleration on the eastern segment began in late 1982. The construction rate for the segment extending from Tynda eastward rose to 9 kilometers per month and for the segment from Urgal westward to 10.9 kilometers per month between November 1982 and February 1983.

Building the BAM

The building of a railroad north of the Trans-Siberian Railroad is the realization of an old dream. The route destined to become the BAM was one of two included in a preliminary design worked out by the Czarist Railroad Ministry between 1911 and 1914, but its implementation was prevented by World War I. Further surveys were undertaken in the early 1930s, and initial construction began before World War II. Construction occurred sporadically following the war, and 1,188 kilometers (km) of the BAM's total length of 4,333 km (2,692 miles) were completed by the early 1950s. The project then went into limbo until 1967, when, without fanfare, survey and design began anew on the final 3,145 km. The Trans-Siberian Railroad at 6,581 km is much longer than the BAM. Even from its junction with the BAM at Tayshet to the Pacific Coast, it is some 440 km longer than the BAM.

Official recognition for the BAM's revitalization came in March 1974 when Brezhnev proclaimed its construction a major project of the 10th Five-Year Plan (1976-80). Completion was set for 1983. However, slower-than-expected progress and a tunnel disaster in 1979 contributed to rescheduling the date to 1985. Finally, with tunneling problems still unresolved, the Soviets struck a compromise and called for the completion of tracklaying in 1984 and the full opening of the BAM in 1987 or 1988.

The post-1974 BAM project consists of two separate lines, the Baikal-Amur Mainline and the Little BAM (see figure 3). The Baikal-Amur Mainline stretches from its western terminus at Tayshet, a stop on the Trans-Siberian Railroad, eastward to the Pacific port of Sovetskaya Gavan'. The sections completed by the 1950s were on both ends of the line—720 km between Tayshet and Ust'-Kut (Lena station) and 468 km between Komsomol'sk and the Pacific. In addition, the 168-km line between Komsomol'sk and Berezovyy was already in operation for timber hauling and required only reconstruction.

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The Little BAM is much shorter. It consists of a north-south line running nearly 400 km from Bamovskaya, a small station on the Trans-Siberian Railroad, north through Tynda to Berkakit in Yakutia. Construction of the southern section between Bamovskaya and Tynda actually began in 1972, before Brezhnev's 1974 announcement of the BAM project. The little BAM line was completed through Berkakit in 1978. The entire BAM system, therefore, consists of over 4,700 km of track, of which some 3,500 km remained to be constructed at the start of the post-1974 phase. When reference is made in the text to BAM investment, manpower, and so on, the little BAM is included.

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alone jumped by nearly 50 percent to 21.4 km per month. This faster pace was continued through at least August 1984 on the western segments, and—if maintained—would have allowed completion of tracklaying by the November deadline. The Soviets announced the completion of tracklaying on the eastern segment in April 1984,

by late September, tracklaying rates on that segment must have risen to about 35 km per month—50 percent higher than former peak rates achieved in that segment. This higher rate is equal to the highest observed rate for total BAM construction when four tracklayers were operating simultaneously—only two tracklayers are in operation on the western segment.

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The claimed completion of the line on 29 September, more than a month ahead of schedule, suggests that a second decision was made last summer to further accelerate the pace of tracklaying.

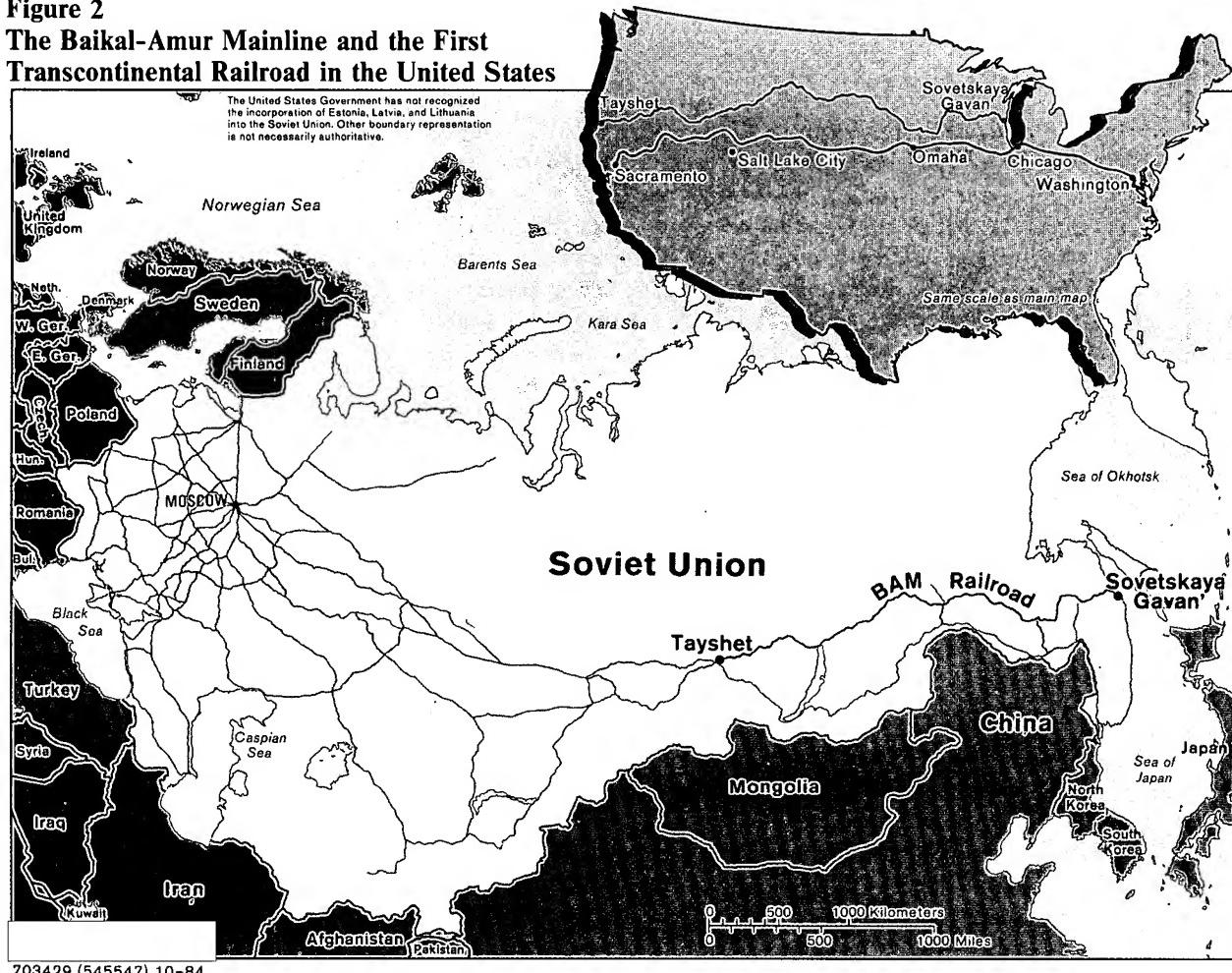
70 km of track remained to be laid on the BAM's western segment. To close this gap

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Figure 2
**The Baikal-Amur Mainline and the First
 Transcontinental Railroad in the United States**



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Both decisions to increase the pace of construction almost certainly were made by the Kremlin. The BAM is a nationally prestigious project, commands a work force of more than 100,000 (including military construction troops), and has a construction budget of about half a billion rubles per year.

Moscow has not revealed the reason behind the push to complete tracklaying, but we think it originally was a face-saving measure for this highly visible project, whose problems cannot be overcome for many years. Costs—both in political terms and in rubles to correct added defects—might well escalate if construction were kept under a national spotlight. The Kremlin could then spread the costs of both completing the BAM and redressing mistakes over a longer time frame.

The decision to accelerate tracklaying further probably was made after the BAM's problems were discussed at a June 1984 conference in Tynda chaired by Geydar Aliyev, the Kremlin's transport overseer. Because the new schedule moved BAM completion from a celebrated date to one with no known prestige value, we speculate that during the June conference Aliyev, and hence the Kremlin, was made aware of the scope of the BAM's construction deficiencies. Some of these deficiencies resulted directly from the Kremlin's pressure to complete tracklaying in 1984.

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Environmental Constraints on BAM Construction

Construction of a railroad system of the BAM's length would be a major challenge under the best conditions. The problems of building the BAM have been magnified because it passes through a remote, geologically complex, and extremely inhospitable region. Most of the route traverses mountainous territory, and seven main north-south ranges lie at right angles to the line's generally east-west alignment, providing few easy passages. There are nine major rivers requiring large bridges, as well as numerous smaller stream crossings. Over 25 km of tunnels are required; the longest, the Severo-Muyskiy Tunnel, is over 15 km. In the less mountainous eastern section, the route passes through extensive areas of bog. Even more forbidding than the topographic obstacles are the environmental constraints. The harsh, cold climate, where winter temperatures drop to -50 degrees Celsius in some places, heavily strains both men and machinery and greatly limits productivity. More than 50 percent of the route crosses permafrost, which adds substantially to the engineering and construction work required to ensure stability of the roadbed and track alignment. Earthquakes also occur frequently in about 1,000 km of the western BAM's zone.

Tunneling Problems

The Soviets' biggest engineering headache seems to be the construction of the seven major tunnels between Tayshet and Chara. The tunnels are challenges, in some cases requiring tunnelers to bore through permafrost or compensate for seismically active geology. At least two serious cave-ins have occurred in boring the tunnels. The disaster at the Severo-Muyskiy tunnel must have been a blow to the entire project and a turning point that led to the decision to delay the BAM's full operation. Indeed, the Soviets now have openly linked the tunnel's delayed completion with the postponement of full operation until 1988. However, they have not reported the loss of life or machinery in the disaster. As the most challenging of the tunnels, Severo-Muyskiy must have required many skilled workers and machines; some of these were surely lost. The Soviets reported in June 1984

that a second serious cave-in had occurred—at the Kodar tunnel. Although accounts in the Soviet press have varied, it appears that, with the accelerated pace of construction, tunneling ran dangerously ahead of arch reinforcement, and the permafrost finally gave way under the heat of the tunneling operations. [redacted]

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The Soviets claim, [redacted] that railroad bypasses have been built around six of the seven tunnels—all but Kodar. [redacted]

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[redacted] a bypass around the Kodar tunnel was nearing completion [redacted]

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These bypasses are quick fixes that will limit the capacity of trains negotiating the BAM's western segment. The bypass around the 15-km Severo-Muyskiy tunnel [redacted] for example, climbs a 3- to 4-percent grade.² The Soviets probably will press powerful diesel-electric locomotives into service along it. Nevertheless, the difference between a 1- and a 3-percent grade will reduce their carrying capacity by about two-thirds. In addition, sharp curves will reduce train speeds, limiting the capacity of the bypass.

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Defective Work

The drive toward the BAM's early completion has resulted in numerous other examples of shoddy work, whose resolution will tie up construction crews long after the line is nominally complete. The chief construction inspector of the BAM's board of directors, in an article in the March 1984 *Gudok*, the Soviet railroad newspaper, reported that inspection services "found about 1,400 instances of defective work on the BAM during the past year"—presumably 1983. He attributes this to the fact that "builders, striving for a fast work pace, do not always attach importance to the dependability and durability of the facilities they are putting up." He notes that "inspectors' numerous reminders and warnings are greeted with silence and [the builders] take shortcuts that haven't been cleared with anyone."

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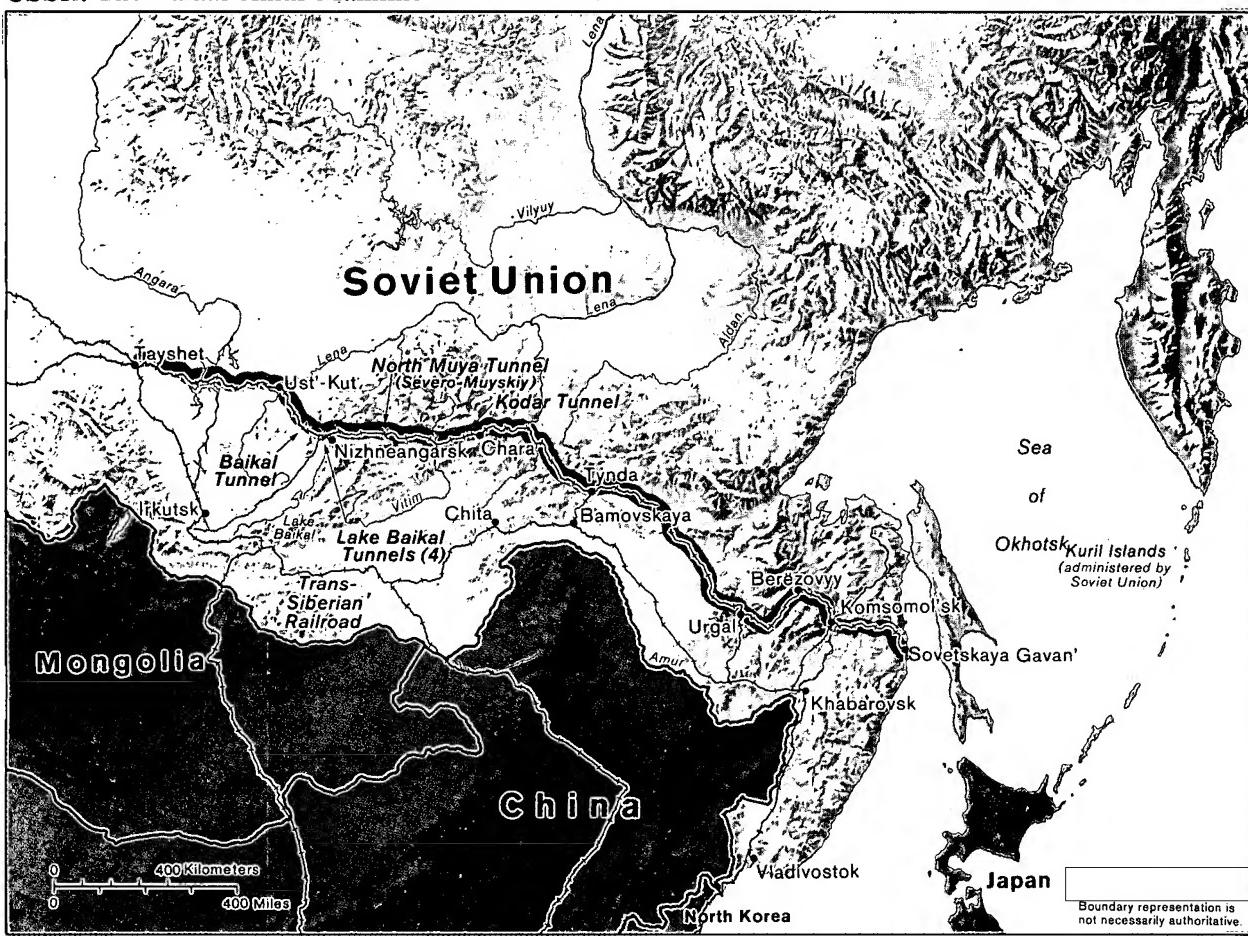
² Most railroad designers consider a 1-percent grade, a 1-foot rise over a distance of 100 feet, fairly steep for freight trains [redacted]

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Figure 3
USSR: The Baikal-Amur Mainline



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The inspector goes on to cite examples of poor roadbed construction, tight curve radii and steep inclines, violations of installation procedures in bridge construction, and the failure to install devices necessary for maintaining stable frozen ground temperatures in bridge foundations and other manmade structures. Although we cannot verify all of the chief inspector's claims, [redacted] many instances where workers have taken obvious shortcuts to complete the line on time [redacted]

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Table 1
USSR: Estimated Construction and Installation Costs for the Baikal-Amur Mainline^a

	Million Rubles		Million Rubles
1974	NEGL	1979	470
1975	335	1980	470
1976	335	1981	490
1977	335	1982	510
1978	390	1983	600

^a Costs are derived from Soviet claims, which are believed to be in constant 1973 rubles. Costs exclude the work done on the 1,188 km of the BAM completed by the early 1950s. See appendix for the method used in determining costs.

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What Happened to the Vitim Bridge?

The Soviets have been unusually candid—even if somewhat late—in their reports of tunneling problems, and a few reports have surfaced on the defects that resulted from the haste to complete the BAM. But Moscow's candor has not been complete. Other major structures have slipped well behind schedule. The example of the Vitim bridge arouses suspicion as to how complete the BAM is.

On 2 July 1984 TASS reported: "The last major waterway (the Vitim river) has been overcome. A tracklayer has crossed over a 500-meter bridge and is heading toward the foothills of the Kodar mountain range." A tracklayer indeed was present east of the Vitim river. The tracklayer, however, apparently crossed the river over temporary track laid on an existing highway bridge.

We suspect the Vitim bridge is not the only example of phantom construction.

yet to be made. The head of construction, perhaps attempting to retain his work force, claims that only one-half of the investments have been "assimilated." Both estimates probably exclude the costs of redressing shoddy construction, a topic that the head of construction sidestepped.

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Resources must now be devoted to developing the BAM's infrastructure—stations, repair shops and equipment, necessary support plants in the construction industries, and the improved living quarters and consumer services required to attract and hold the labor force. Lack of an adequate infrastructure, particularly in construction materials industries, probably has contributed to the delays in finishing major structures along the BAM.

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Siberian Resource Development—No Quick Payoff

While the infrastructure is being built, Soviet planners will probably try to redirect attention to the payoffs resulting from completion.

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The Soviets declare that a draft program for economic development of the BAM zone up to the year 2000 is nearing completion. Details for individual years of the 12th Five-Year Plan (1986-90) will be included. The plan notwithstanding, the outlook for significant progress on development of resources (see figure 8) looks poor until at least the 1990s. The unfinished BAM itself will continue to limit access to resources west of Tynda through much of the 1980s. In addition, the prospects for attracting additional domestic and foreign capital to the zone—at least during the 1980s—are poor. World markets are soft for most of the more accessible resources in the central and eastern portions of the BAM corridor and are expected to remain sluggish through the 1980s.

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The BAM—What Now?

Completion of the BAM is clearly still distant. According to the railroad's head, more than one-third of the capital investments intended for the project have

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Table 2
USSR: BAM Construction Rates ^a

Average kilometers of track per month

	Construction Segments			
	Nizhneangarsk Eastward	Tynda Westward	Tynda Eastward	Urgal Westward
October 1979–February 1983	6.7 ^b	7.8	5.4	5.5
February–October 1983	10.0	11.4	4.8 ^c	8.7
October 1983–August 1984	11.9	11.9	NA ^d	NA ^d

^a Each construction rate is calculated as the distance between the points of new tracklaying divided by the interval of time (calculated in fractions of months) between the two dates.

^b Represents data for September 1979 through February 1983.

^c This is a minimum value. The actual point where new construction was under way was not observed.

^d The Soviets report that the segments were completed in April 1984.

According to Soviet claims, the development of the resource corridor of 1.5 million square kilometers surrounding the BAM—running 150 to 200 km on each side of the rail line—will require three times as much investment as was allocated for construction of the BAM itself, or upward of 15-25 billion rubles.³ The Soviets will probably not try to shoulder the entire capital burden of resource development on any substantial scale. Growth in domestic investment through 1990 appears to be earmarked predominantly for the energy sector and the agro-industrial complex.⁴ Projects along the BAM zone do not figure heavily in these programs. Although some of the raw materials available along the BAM corridor are in short supply in the industrial heartland—coking coal, for example—we doubt that Moscow plans to underwrite the

high development costs or bear the large transport costs associated with BAM resources to resolve these current shortages. Moscow probably has lower cost strategies to relieve these problems. In the case of coking coal, for example, Moscow has not yet fully implemented its plans to significantly expand mining of higher quality coking coal deposits at Kuznetsk, some 2,000 km closer to major consumers. Completion of tracklaying along the BAM may, however, free some general construction funds for other uses. Some of this excess will surely go to infrastructure development, which was placed on the back burner to accelerate completion of tracklaying.

³ According to Soviet claims, spending on construction and installation work on the BAM through 1983 totaled about 4 billion rubles. Claims that from one-third to one-half of the work remains to be done place total BAM construction costs at 6-8 billion rubles. At a cost triple that for constructing the BAM, resource development would run to 18-24 billion rubles. We use the more general range of 15-25 billion rubles. This is equivalent to 23-36 percent of total transportation and industrial investment in 1982.

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**The Disaster at Severo-Muyskiy Tunnel—
A Soviet Account**

The Soviets provided the following accounts of the 1979 accident at the Severo-Muyskiy tunnel in a 1983 Pravda article more than three years after the event:

Twelve thousand cubic meters of water, sand and rock, under enormous pressure, surged into the gallery in a matter of seconds. The column of water that had been concealed in the mountain, it was learned later, was 140 meters high.

The drilling unit, which weighed many tons, was instantly hurled back dozens of meters, as if it were a piece of fluff. The lights went out. Only the lamps on the tunnelers' hard hats glimmered faintly through the spray of water and the thick fog rising from thermal springs. The hot roaring mass rushed swiftly through the tunnel, sweeping up everything in its path.

The Likely Soviet Agenda

Budget permitting, the more likely candidates for development or expansion in the near term are in the central and eastern sections of the BAM—timber at Komsomol'sk and perhaps the Upper Lena areas, and coal, iron ore, and phosphates deposits in the South Yakutiya region. Over the last year the Soviets have resurrected the possibility of developing copper deposits in the Udokan area, and they have done some preparatory work for developing a high-quality asbestos deposit in the North Baikal Territorial Production Complex. Most of the BAM's vast resources probably are not intended to provide a significant boost to domestic consumption for some time—perhaps not until after the year 2000. Nevertheless, Moscow would like to prepare the foundations now by sharing some infrastructure and development costs with other countries on a compensation basis. For most of the projects under consideration now, the Soviets will look to Japan as a financier, source of machinery and equipment, and/or as a market for the raw materials.

Komsomol'sk—Upper Lena Area. The Soviets already have begun timber operations along the BAM corridor—generally in the Komsomol'sk area. According to a Soviet study, Komsomol'sk is likely to be the only profitable zone in the BAM service area through 1990.

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Total supplies of logs provided within the BAM zone currently amount to nearly 15 million cubic meters (m^3) annually, about 15 percent of the country's total. By 1990 we believe the Soviets could be in a position to increase shipments of wood from this area to 30 to 35 million m^3 , including 20 million from timber tracts closest to the rail lines. Projections made by Soviet officials indicate that over three-quarters of these logging activities will be concentrated in the Upper Lena and Komsomol'sk districts. About 80 percent of timber production from the BAM zone for the foreseeable future is intended for export. If markets can be found for this potential 24-28 million m^3 , the Soviets could earn more than \$1 billion a year in foreign exchange or the equivalent in machinery and equipment for further Siberian development. The remaining 20 percent—6-7 million m^3 —will probably be used in local construction.

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Japan will be the main export target, although small amounts of wood will go to North Korea and China.⁵ It will be some time, though, before Japan's large wood-processing capacity—idled by weak demand—will need raw logs to meet higher production requirements. Japanese demand for wood has been weak since the late 1970s, and the slump during the last two quarters in the local economy suggests a continuation of sluggish demand. Even when a recovery resumes, the Soviets will be competing with the ASEAN countries for growth of the Japanese market. Tokyo is interested in the high-quality Angara pine from the BAM region. The Japanese have been willing to pay a premium for this lumber on world markets.⁶

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⁵ Despite weak demand and declines in the world price for logs, the Soviets have earned the equivalent of \$1 billion in foreign exchange between 1980 and 1982 from log exports to Japan.

⁶ Because the quality of Soviet processed products is poor, Moscow sells raw timber to Japan, which in turn processes it for domestic needs and reexport.

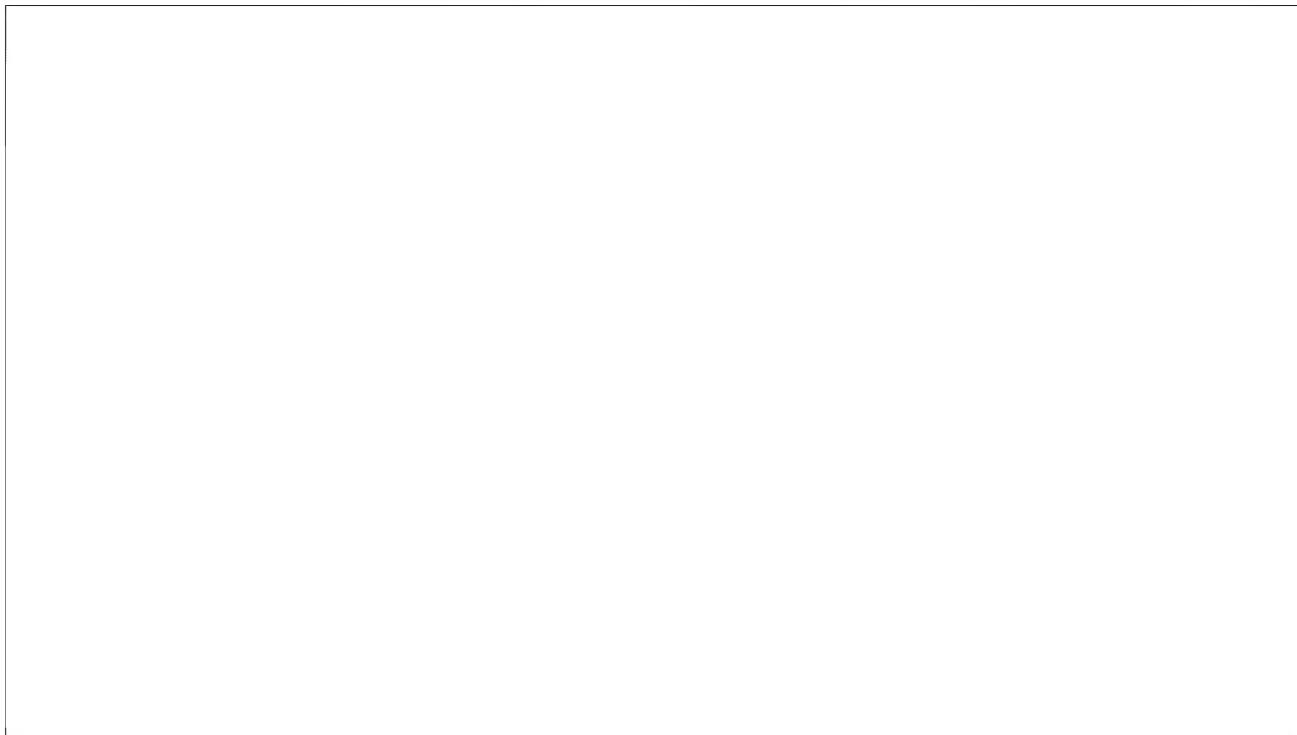
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Although Moscow has tried often to entice Tokyo into joint development in Siberia and along the BAM, the Japanese are likely to consent only to compensation agreements. As has been its practice in the past, Japan will export logging and wood-processing equipment in return for its timber imports. [redacted]

South Yakutiya. Aside from continuing to increase timber operations, the Soviets' only well-developed plan for resource development in the BAM zone is for the South Yakutiya area. The Little BAM already has been extended to the Neryungri/Chulman area to support coal mining operations there. The Soviets intend to use rail construction teams as they finish their work on the BAM to extend the Little BAM from its terminus in the Chulman area to Aldan some 200 km farther north. There they hope to exploit large deposits of iron ore and phosphate. The resources of the South Yakutiya area will be used both for regional development and for export. However, large-scale exploitation will not begin until the 1990s. [redacted]

The South Yakutiya coal deposits are estimated by the Soviets at 40 billion metric tons. The Soviets expect that the Neryungri deposit alone, which is being developed under an existing agreement with Japan, will produce 13 million tons of coal a year. The Japanese granted the Soviets \$540 million in credits for equipment to develop Neryungri in return for 104 million tons of coal to be delivered over a 16-year period. According to the terms of the trade protocol, the Soviets will supply 84 million tons of coking coal from South Yakutiya during the period 1983-99. The Soviets have also agreed to send Japan 1 million tons of coking coal per year from the Kuznetsk basin during 1979-99 to speed up credit repayments. The Japanese were to receive initial shipments of 3.2 million tons of coking coal from Neryungri in 1983, and the volume was to increase to about 5.5 million tons a year by 1985. But the Soviets missed this deadline. So far, Neryungri is yielding mainly steam coal from its upper strata for regional boiler use. [redacted]

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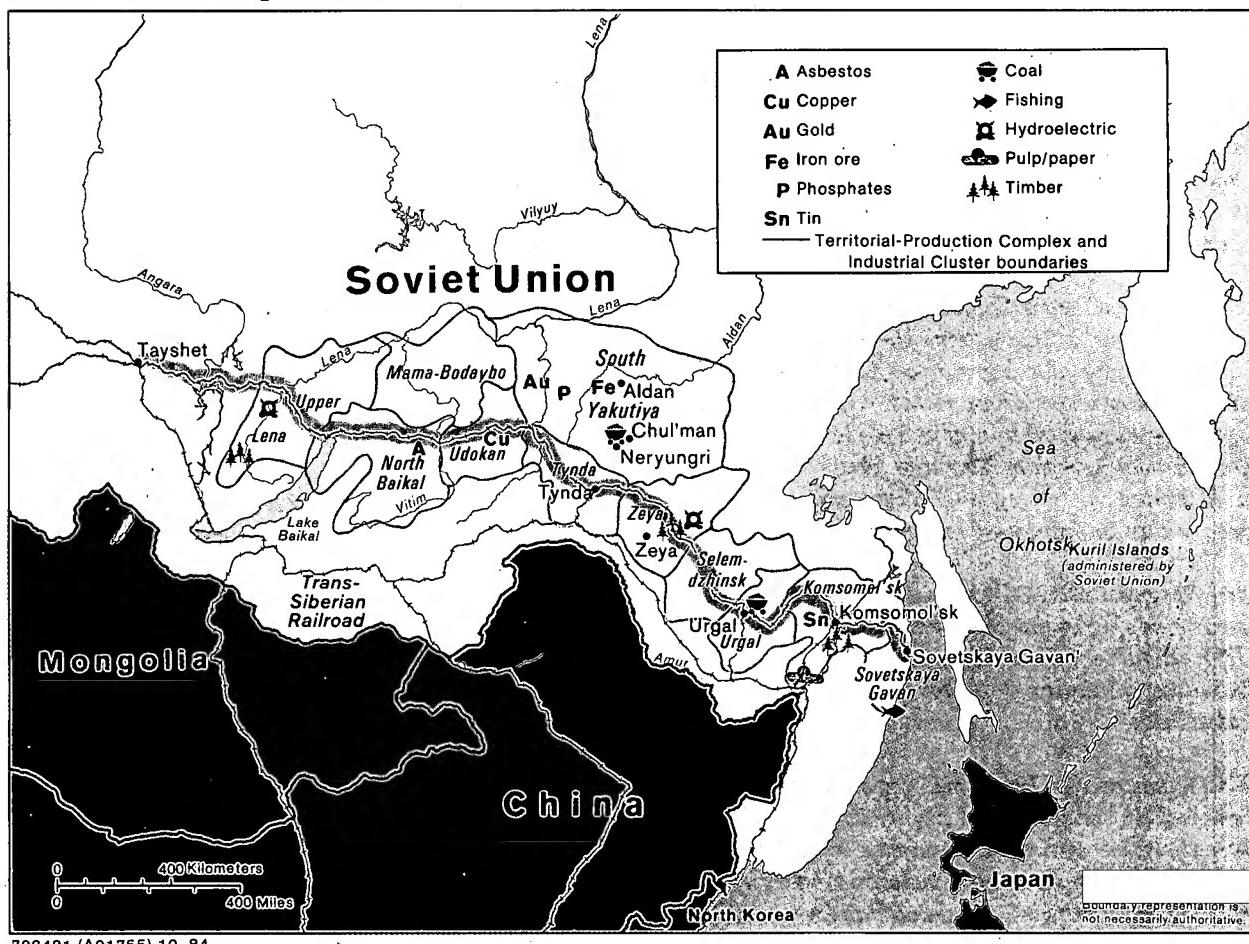
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Figure 8
Resource Areas Along the BAM



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**USSR: Main Resource Centers Along the BAM
Service Area**

Development of the South Yakutia Territorial Production Complex (TPK) will be based on high-quality coal in the Chul'man area and iron ore at nearby Aldan. In addition, the TPK has significant deposits of mica, apatite, and gold. It will provide the starting point for development of the Vilyuy gasfields. []

become a major transshipment point and storage facility, and its fishing industry operations also probably will expand. Much of its success, however, will depend on the course of Soviet-Japanese relations. []

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The Urgal Industrial Center will focus on development of power, initially from the Bureya Dam but later from other dams projected for the Bureya River and its tributaries. These plants will supply electricity to the eastern section of the BAM and to the Far East economic region. The area also contains significant deposits of coking coal. Urgal probably will function as an important transshipment point. []

The development of the Upper Lena Territorial Production Complex depends largely on future hydroelectric power development on the Lena and Kirenga Rivers. The Soviets also plan major timber development here. []

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The Zeya Industrial Center is also based on hydroelectric power, in this case from the Zeya Dam. This TPK probably will undergo extensive development, including a buildup of timber and machine-building industries. []

The area around the North Baikal Territorial Production Complex contains large deposits of many minerals, including molybdenum, chromite, and asbestos. Development of a wood-products industry will be contingent upon the availability of inexpensive hydroelectric power. []

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The Komsomol'sk Territorial Production Complex, centered on the industrial city of Komsomol'sk, already exists and should increase in size and influence. It possesses a sizable industrial base, including an iron and steel mill, machine-building enterprises, and petrochemical plants, all of which are likely to expand. The timber and downstream pulp and paper industries and the tin-mining operations in the area also are likely to develop. []

Development of the Udogan Industrial Center will be based on the major copper deposits located there. []

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The Tynda Industrial Center, the "capital of the BAM," probably will continue developing as a transport center and machine-repair base []

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The port in the Sovetskaya-Gavan' Industrial Center, at the eastern end of the BAM, has the potential to

Note: The resources of the BAM zone are described and analyzed by Victor Mote in Soviet Natural Resources in the World Economy, ed. Robert G. Jensen, Theodore Shabad, and Arthur W. Wright (Chicago: University of Chicago Press, 1983). []

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The Japanese, however, probably are not pressing the Soviets to accelerate production. The recovery of Japan's steel industry is not as strong as expected, and the Japanese are trying to delay shipments and obtain lower prices for coking coal from other suppliers. Under these conditions, the schedule for coking coal extraction at Neryungri may be further stretched out, and the Soviets probably will delay development of additional Chulman deposits.

[redacted] geological surveys place iron ore reserves in the Aldan upland at 840 million to 1.5 billion metric tons. Soviet reports indicate that annual production from the Aldan region will be 13-17 million tons, of which as much as 5 million tons a year could be exported to countries in the Pacific Basin. But Soviet prospects for iron ore exports—mainly to Japan—are limited unless the Japanese steel industry sustains its recovery. More of the ore probably would be used in Siberia itself. The Soviets have long talked about constructing a fledgling steel industry along the BAM zone to support regional development. The proximity of Aldan ore and Neryungri coking coal makes the Little BAM corridor a likely location for such a complex. However, a major policy decision would be required to redirect already inadequate capital available for refurbishing the main steelmaking plants in the western part of the country to build a new steel plant in this area.

Meanwhile, the Soviets have estimated the size of the Seligdar phosphate reserves near Aldan at 3 billion metric tons. [redacted] the USSR plans to invest \$190 million over the next 10 years to develop these deposits with Japanese assistance. Development of the deposits will make it possible to increase supplies of badly needed phosphate fertilizers to Siberia. Supplies are now transported from the western part of the country. Given large regional demand, little of the eventual output from Seligdar probably will be available for export.

Udokan. The Soviets have said that the opening of the BAM through the Chara station will promote exploitation of the Udokan copper deposit—one of the largest in the world. Discovered in 1949, Udokan reportedly has high-quality ores and the potential to support production of 400,000 metric tons of copper per year—equivalent to about one-third of the total produced in the USSR during 1983.

The Soviets have touted the project in the press during 1984.

[redacted] Future export opportunities seem dim, however. The world market for copper is in a slump whose end is not in sight. Moreover, Soviet domestic demand for the foreseeable future can be met by ample and more accessible deposits closer to the industrial heartland.

Neither the Soviets nor foreign investors are likely to contribute the capital required to develop Udokan now. Western experts estimate that total infrastructure and industrial development could cost well in excess of \$2 billion. This would make it the most expensive single development project along the BAM corridor. The Japanese—realistically the only partner for the project—have resisted Soviet overtures for joint development of Udokan since the mid-1960s, even when the outlook for world copper demand was much more buoyant.

Molodezhny Asbestos. [redacted] the Molodezhny deposit, located about 25 km south of the Ust'Muya station on the BAM, contains 18 billion tons of long-fiber asbestos ore of an unusually high grade. Until a few years ago,

Soviet prospects for penetrating the Pacific Basin market by 1990 were better for asbestos than for other resources available in the BAM zone. Since then, worldwide concerns about the health hazards of asbestos have contributed to a significant softening in the market. Furthermore, experts at the US Bureau of Mines note that the market for the long-fiber grades has fallen even faster than that for other grades. The Soviets probably will shelve large-scale development of the Molodezhny deposits until the West determines what—if any—measures it will take to regulate the use of asbestos. Moscow in the meantime may opt for some small-scale development to support regional expansion of the cement industry.

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Foreign Assistance

Realistically, Japan has been and continues to be the Soviets' only partner for developing Siberian resources. Soviet and Japanese representatives will return to the negotiating table this fall for trade talks. Siberian projects reportedly are on the agenda.

No major agreements on such projects are expected to be reached at the meetings. Even during the mid-1970s, when mineral and metals markets were more robust, USSR-Japanese negotiations for joint development of Siberian resources produced only limited agreements.⁷ Since then, world mineral and metals markets have softened, and Tokyo has become more cautious about diversifying its sources of raw materials. The Japanese—who so far have insisted on compensation deals with the Soviets in Siberia—will be unlikely to finance arrangements that would tie them to substantial imports of commodities for which demand looks poor (metals), or uncertain (Molodezhny asbestos), or for which they have developed alternative suppliers (Chul'man coking coal).

Other Returns on the BAM Investment

In view of the poor prospects for resource development, the Soviets may well have to be satisfied with the achievement of secondary objectives when the BAM is fully operational later in the 1980s. One of the early justifications for the BAM was that it would be a more secure alternative to the Trans-Siberian Railway (Trans Sib) for moving military supplies and troops to the Far East. Indeed, when surveying of the BAM resumed in the mid-1960s, Sino-Soviet relations were tense. Even with today's long-range missiles, supersonic jets, large-capacity transports, and better Sino-Soviet relations, the military probably still supports the BAM as a strategic link to the Far East.⁸ During peacetime—when fully operational—it will ease the strain of troop rotations and resupply, which often disrupts traffic on the now crowded Trans-Sib.

After the 1973 Arab oil embargo, the Soviets hoped that the BAM could be used as a supply route for crude oil shipments between Tyumen' and the Far East. In 1974 Moscow proposed sending up to 25 million tons of crude oil to Japan via the BAM in specially designed eight-axle tank cars. The Japanese rejected the deal. Growth in Soviet oil production has slowed dramatically in the 1980s, and world oil trade is a buyer's rather than a seller's market. Despite Japanese disinterest and the changed outlook at home, the Soviets pursued development of their eight-axle tank cars—which now can find only limited domestic use—and developed about 8 million tons of now excess refining capacity in the Far East. They may use the BAM for transporting oil from Tyumen' to the Far East. The possibility remains—although remote—that the Soviets will try to resurrect the oil export deal on a smaller scale if the need for foreign exchange becomes acute.

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The BAM's prospects for earning foreign exchange are brighter as an alternative route to the Trans-Sib for land-bridge service.⁹ The Soviets now earn about \$300 million a year from such service, although they recently have lost some of their competitiveness in the Asia-to-Europe route to independent container ships that have been able to undercut both fixed shipping rates and those of the Trans-Sib land bridge. The BAM, which is several hundred km shorter than the Trans-Sib provides a second route for increasing the capacity of container shipments, particularly if container-handling facilities are added at the port of Sovetskaya Gavan'. The BAM, even in partial operation, could help ease some current problems with the service. For example, it could be used to return empty container cars to Far Eastern ports, reducing the strain on the Trans-Sib.

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A major expansion of the car-handling facilities at Tayshet, where the BAM and Trans-Sib converge, will be required before the BAM can be used as an important alternative to the Trans-Sib for general economic cargoes, materiel and men for the military, or land-bridge service

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Outlook

The BAM's budget survived and probably grew even during the difficult economic times in the USSR during the late 1970s and early 1980s. Once the national spotlight has shifted, the BAM may not command the same priority when investment demands are rising in other sectors of the economy—including the rest of the railways. Nevertheless, Soviet claims suggest that work to bring the railroad into full operation could cost an additional 2-4 billion rubles. To meet the new deadline—in 1987 or 1988—the Soviets would have to maintain at least the current budget of roughly 500-600 million rubles per year. If the BAM budget does not survive, completion could be pushed into the 1990s.

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⁹ A system that currently moves freight containers from the Far East to Europe along the Trans-Sib at costs below standard conference shipping rates. The BAM would offer additional or alternative service at least to Tayshet.

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Whatever money is allocated will have to go to the long-neglected infrastructure—railway stations, repair facilities, and a solid construction base, as well as the social services and housing necessary to attract and hold a willing labor force. Neglect of this infrastructure could degrade appreciably the BAM's ability to serve Soviet economic and military interests.

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Appendix

Methodology for Deriving BAM Construction and Installation Costs

- 1974: The Soviets announced that construction of the BAM was to resume. We assume only negligible amounts were actually spent on the BAM in this year.
- 1975-77: Derived from the 1978 Soviet claim that over 1 billion rubles of capital investments had been spent on the railway (*Summary of World Broadcasts*, SU/W976, 14 April 1978). The 1 billion rubles is divided equally between the years 1975 through 1977.
- 1978: Derived from the Soviet claim that 380-400 million rubles was to be spent on construction and installation work in 1978. (SWB, SU/W976, 14 April 1978.) The midpoint of the claim is used.
- 1979-80: Derived from estimates for 1976 through 1978, and the Soviet claim that 2 billion rubles were allocated for building the BAM during 1976 through 1980. (*Zhelezno-dorozhnyy Transport*, No. 12, December 1976, pp. 3-5.) The residual is divided equally between 1979 and 1980.
- 1981: Derived as the midpoint between the estimates for 1980 and for 1982.
- 1982: Derived from the estimate for 1983, the Soviet claim that spending for the BAM was to increase by 90 million rubles in 1982 (*Gudok*, 25 December 1981, p. 2), and our analysis [redacted] that this increase was not implemented until 1983.
- 1983: Derived from the Soviet claim that construction and installation expenditures on the BAM were as much as those on West Siberia—or 600 million rubles (*Daily Report—Soviet Union*, FBIS-SOV-84-164, 22 August 1984, Vol. III, No. 164, p. R3).

Note: Soviet claims about BAM construction and installation costs, like other investment claims, are thought to be in constant 1973 prices. These costs exclude work done on 1,188 km of the BAM completed by the early 1950s.

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